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ANEURYSMS OF THE AORTA

WITH ESPECIAL REFERENCE TO THEIR POSITION, DIRECTION AND EFFECTS.

BEING

AN EXERCISE FOR AN ACT FOR THE DEGREE OF M.B.
IN THE UNIVERSITY OF CAMBRIDGE.

BY

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"Of all studies, those are best calculated to promote the business of clinical observation which are especially conversant with the nature of morbid processes."

Latham, *Lectures on Clinical Medicine.*

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ANEURYSMS OF THE AORTA.

It would appear that for many ages, any knowledge of the occurrence of internal aneurysm remained a secret locked within the dead body. An extraordinary veneration for the dead forbad men to open the bodies of the departed except for the process of embalming, a practice which as observed by Matthew Baillie (¹), though it might expose many parts of the body to observation, was little likely to do so to the more educated members of the community. And so, in the writings of early Greek and Arabian physicians there is no mention of the subject to be found and it was only in the sixteenth century, when at length the human body came to be more frequently examined and dissected after death, that the secret was revealed and that mention of the occurrence of the disorder began to be made with an increasing frequency. Amongst the earliest allusions to the disease may probably be considered that of CAROLUS STEPHANUS, early in the sixteenth century, who saw "in the carcase of a patient, part of whose lungs on the right side, by reason of some injury or other, was altogether consumed and corroded, the auricle of the heart on the same side, which had grown into so great a magnitude that it seemed to be three times larger than the other" (²); and that of ANDREAS LAURENTIUS, who found in the Chevalier Guicciardini, "that the heart had grown to such a vast bulk as to have become almost a prodigy, and to take up nearly the whole cavity of the thorax, the mouth of the great artery being so much enlarged as to be equal in bigness to the arm" (³).

(¹) Introductory lecture to course on anatomy.

(²) De dissectione partium corporis humani, 1545.

(³) Historia Anatomica, 1627.

FERNELIUS speaking of external aneurysms had written: "An aneurysm likewise happens sometimes in the internal arteries, especially under the breast, about the spleen and mesentery, where a vehement pulsation is often observed" (1); but it was not until the year 1557, that any certain knowledge of their existence was obtained, when VESALIUS "for example's sake, having observed a certain pulsating tumour about the vertebræ in the back, in consequence of those things which he had observed before in external aneurysms, said that there was an aneurysm from a dilatation of the aorta," and was able to point out after death in the body of Leonardus Velserus, the abdominal aorta so dilated as to be almost as big as an ostrich's egg (2).

JOANNES BAPTISTA SILVATICUS (3), writing a particular treatise on aneurysm in 1595, makes no mention of the disease; and so slowly was knowledge of the subject advanced, that JOANNES RIOLANUS, writing in 1658, makes the positive assertion that "an aneurysm happens but seldom in the trunk of the aorta, by reason of the thickness of its coats" (4); and JOACHIMUS GEORGIUS ELSENERUS, describing in 1670 an aneurysm of the aorta found by Gulielmus Riva, prefixed as a title to his remarks the words "De *paradoxico* aneurysmate aortico" (5).

From this time, dissection of the dead body seems to have become more frequent. Dilatations of the aorta were no longer esteemed rare, and many cases were recorded. Yet still there followed but little progress in knowledge concerning the disease.

Books of wider or more limited range were written upon the subject, but they could be summed up by FREIND, writing upon the knowledge in his day of the whole subject of aneurysm, in the words that he had been able to find only a successive series of hypotheses and conjectures everywhere involved in obscurity and confusion (6), the writers "neque argumentum de quo scribere aggressi sunt neque id ipsum quod super argumento suo scripserint, satis comprehendentes" (1).

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(1) Pathologia, l. 5, c. 12.

(2) Theophilus Bonetus. Sepulchretum, 1700.

(3) De Aneurysmate Tractatio, 1595.

(4) Encheiridium Anatomicum et Pathologicum, 1658.

(5) Acta Nat. Curios.

(6) Freind's History of Physic, 1750.

Speculations and conjectures they were for the most part concerning the nature and immediate cause of aneurysm, and as to the nature of the parts which formed the aneurysmal sac.

Fernelius (2), Forrestus (3), Diemoerbroeck (4), had advanced the doctrine, held very commonly by authors and physicians till much later times, that it was ever produced by a dilatation of all the coats of the vessel; whilst, on the other hand, Sennertus (5), Silvaticus (6), Hildanus (7), and others, had held that it was universally caused by destruction and rupture of the proper coats of the artery, a doctrine stoutly supported in later days by the solid anatomical knowledge and mature reflections of Antonio Scarpa (8); writers on either side holding firmly to opinions formed often upon scanty and imperfect observations, and exhibiting reluctance to admit the possibility of more than one or of a combined cause, in the production of one and the same effect.

Early in the present century, followed the writings of Allan Burns (9) and of Joseph Hodgson (10), modifying the different doctrines held generally in previous times, and showing how that these writers had erred in taking too partial a view of their subject, and that here, as elsewhere, truth was many-sided, and was not to be found alone in one or other of the rival camps, but that it lay between the two. They thus revived a doctrine that had been held by Lancisi (11), in 1745, and by Guattoni (12), in 1772, that sometimes in dilatation, sometimes in the destruction of the proper coats of the artery, is the earliest commencement of the disease.

(1) A quotation from a work of Paulus Ægineta.

(2) Universa Medicina.

(3) Freind's History of Physic, Part I., p. 187.

(4) *Ibid.*, p. 188.

(5) Opora Omnia. Tom. 5, lib. 5, pars. 1, c. 3.

(6) De Aneurysmate tractatio.

(7) Opera quæ extant Omnia, cent. 3, obs. 44.

(8) Sull Aneurisma Riflessioni, 1804.

(9) Observations on Aneurysm, 1809.

(10) Pathol, and Treatment of Aneurysm, 1811.

(11) De Motu cordis et Aneurysmate, 1745.

(12) De Externis Aneurysmatibus, 1772.

And to them has followed an age of morbid anatomy, of disease studied, scalpel in hand, by the light of its effects; an age of almost daily advance in the science of physic, as opinions and conjecturings have been confirmed, corrected or laid aside by carefully observed and accurately recorded facts concerning the processes and results of disease.

And, on aneurysms of the aorta as on almost every result of disease, observations and writings are multiplied past record; so that I feel, in writing, almost as if apology were due for treading again on so well worn a track, and for seeking further to add to an already so long array of recorded cases of the disease (1).

Yet it is in the fact that I contribute an analysis of careful *post mortem* records of 88 unpublished cases, that my apology consists, for here assuredly it is true that "even in things alike there is diversity, and those that do seem to accord do manifestly disagree" (2).

The remarks that follow are based upon an analysis of all cases of aneurysm of the aorta (in any of its parts) dying in St. Bartholomew's Hospital during the last 17 years, upon whom an examination was made after death, and its results carefully recorded.

They number 88 in all, and bear date from October, 1867, when such records began there first to be systematically made and kept, and include more than one case examined within the last few weeks (3).

With a view to ascertaining how far the aorta is the artery most frequently involved in this disease, and the degree of its relative incidence upon other arteries of the body, I have drawn up a table (appended) of all cases of aneurysm, of whatever artery, that have been *under treatment* in the hospital during the years now under consideration.

(1) Sibson analyzed histories of 594 cases, and 296 museum specimens.

(2) Religio medici, Sir T. Browne, Part II.

(3) Last observation, Nov. 1884, Vol. xi., p. 171.

Relative Incidence of Aneurysm on various Arteries.

Year.	Aneurysm of Aorta.	Aneurysm of other Arteries.
1867—68	10	Popliteal, 3. Femoral, 1. Axillary, 1. Innominate, 1.
1868—69	12	External Iliac, 1. Femoral, 1.
1869—70	18	Popliteal, 4. Femoral, 2.
1870—71	13	Popliteal, 7. Femoral, 1. Innominate, 1. Radial, 1.
1871—72	8	Popliteal, 8. Subclavian, 2. Gluteal, 1.
1872—73	13	Popliteal, 3. Subclavian, 3. Femoral, 1.
1873—74	5	Popliteal, 3. Femoral, 1. Subclavian, 1.
1874—75	17	Popliteal, 1. Femoral, 5. Temporal, 1.
1875—76	12	Popliteal, 3. Femoral, 1.
1876—77	22	Popliteal, 7. Subclavian and Axillary, 3. Dorsalis pedis, 1.
1877—78	14	Popliteal, 2. Femoral, 1. External Iliac, 1.
1878—79	22	Popliteal, 4.
1879—80	15	Popliteal, 5. Subclavian, 1. Innominate, 1.
1880—81	13	Popliteal, 5. Subclavian, 2. External Iliac, 1.
1881—82	21	Popliteal, 1. Axillary, 1.
1882—83	13	Popliteal, 6. Femoral, 1. Carotid, 1.

16 years .	. 228	Popliteal .	. 57	Innominate	. 3
	97	Femoral .	. 15	Carotid .	. 1
Total .	. 325	Subclavian .	. 9	Temporal .	. 1
		Axillary .	. 2	Radial .	. 1
		Subclavian and Axillary .	. 3	Gluteal .	. 1
		External Iliac	. 3	Dorsalis pedis	. 1
				Total .	. 97

The table shows that with an annual average total of 5,000 in-patients, there were under treatment during 16 years, in all, 325 cases of aneurysm. In 228 of these, the disease affected the aorta in one or other of its parts; the popliteal artery being next in the scale of incidence, but affected in 57 cases only. There were 15 cases of aneurysm of the femoral; 9 of the subclavian; 2 of the axillary; and 3 of the subclavian and axillary combined; of the external iliac, 3; of the innominate, 3; and of the carotid, temporal, radial, gluteal, and dorsalis pedis, 1 each.

For the greater convenience in analysis, and for the general arrangement of the obtained results, I have observed the ordinary anatomical divisions of the artery into ascending, transverse, and descending portions of the arch, the descending thoracic and the abdominal aorta, saving that I have made the third or descending portion of the arch to commence at a line drawn through the orifice of the left subclavian artery, this being the point at which the artery first commences to assume a downward course. These divisions can only, of course, be considered as of convenience, and it is not possible in exactness to draw any hard and fast line between the various portions.

There occurred 31 aneurysms of the ascending portion; and of the transverse portion, 29; of the third part of the arch, 10; of the thoracic aorta, 8; and of the abdominal aorta, 9.

Taking these cases *en masse*, a few remarks will commonly apply.

Thus, of the 88 cases, 74 occurred in males; 14 only in females.

The ages were distributed as in the appended table.

Table of Sex and Age.

15—		25—		35—		45—		55—		65—		75—		Total.	
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
—	1*	12	1	32	6	22	2	3	3	1	—	—	—	70†	13

* Anno ætatis 15. † Ages unrecorded of 4 males, 1 female.

So many as 62 (of the 88) cases occurring between the ages of 35 and of 55 years, whilst only one fatal case of the disease had occurred before the age of 25 (¹).

(¹) See Table I., case 29.

In almost all the disease occurred, as is usual, in an artery already enfeebled by atheromatous disease.

Taking now each portion of the arch separately, I shall at first with care describe the anatomy of the part, for in the close study of the relative anatomy of the aorta lies the truest key to the diagnosis of the disease.

The first portion of the arch measures about 2¼ inches in length. Arising from the left ventricle, it lies behind the middle of the sternum on a line with the lower border of the third left costal cartilage, and separated from the lower half of the upper one-third of the sternum only by pericardium and the approximated edges of the lungs. It passes upwards and to the right, as high as to the level of the upper border of the second right costal cartilage, taking an oblique direction behind the sternum and approaching to within quarter of an inch of that bone. For the greater part of its course it is enclosed in a tubular sheath of pericardium common to it and to the pulmonary artery, both vessels being so covered, except where in contact the one with the other.

At its commencement it is in contact anteriorly with the right auricular appendix and the pulmonary artery. As it passes to the right, the pulmonary artery comes to lie upon its left side together with a portion of the left lung. On the right side lies the vena cava superior; whilst behind are the several structures forming the root of the right lung.

Of 31 cases of aneurysm of this part,
26 occurred in males,
5 „ females;
23 of the cases occurring between the ages of 35 and of 55 years.

Table of Ages.

15—		25—		35—		45—		55—65		Total.	
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
—	1	4	—	11	2	8	2	3	—	26	5
				23							

The artery was atheromatous in 28 of the cases; highly so in 14; while in two instances it was noted as healthy (1).

In 18 all the valves of the heart were healthy, and in only 7 were the aortic valves incompetent.

With regard to exact position, the cases were variously distributed.

Four occurred *just above one or other semilunar valve*, in each case small and sacculated, and quickly interfering with the healthy action of the valves (2). Of these cases, one made pressure upon the pulmonary artery (3); one had ruptured through a ragged opening into the pericardium (4).

Eleven cases occurred *immediately above the valves*, more often from the right wall of the aorta, usually of the sacculated type, and with a greater or less degree of associated dilatation of the artery.

The remaining 16 cases occurred at the distance of one inch or more from the valves, and it was not uncommon to find dilatation of the artery from its origin in the ventricle to the point of origin of the left subclavian artery (5). In one case it was remarkable that in the same artery there had occurred no less than six aneurysmal dilatations (6).

One-third of the aneurysms arose from the *right* or from the dextro-anterior aspect of the arch, and the general direction taken by almost all was markedly to the right side.

Those that reached the chest wall and presented anteriorly, did so in the second and third right costal interspaces, eroding usually the second, third, and fourth right costal cartilages or ribs (7), and that part of the sternum that lay adjacent to them (8).

The structures most commonly subjected to pressure were the vena cava superior (9) and the pulmonary artery (10).

(1) Table I., cases 20, 29.
(2) Table I., cases 12, 25.
(3) Table I., case 27.
(4) Table I., case 11.
(5) Table I., cases 4, 9, 10, 11, 24, 26.
(6) Table I., case 2.
(7) Table I., cases 4, 6, 9, 24.
(8) Table I., cases 4, 18, 24.
(9) Table I., cases 1, 4, 7, 16, 17, 19.
(10) Table I., cases 7, 16, 17, 20, 27.

In 3 cases, the right lung was adherent to and formed a part of the wall of the tumour (1).

In 3 instances rupture had occurred into the right pleura (2); whilst two aneurysms, each arising immediately above the heart's valves, had ruptured into the pericardium (3).

The Second, or Transverse portion of the Arch.

Having reached the level of the upper border of the second right costal cartilage, the course of the aorta alters, and it passes now upwards and backwards, and obliquely from right to left, to the left side of the body of the third dorsal vertebra. This is the ordinary termination observed by the anatomists; but I have made this transverse portion to end, as I think it more truly does, at a line drawn at a right angle to the aorta through the place of origin of the left subclavian artery.

The upper part of the arch is on a level with the lower border of the second dorsal vertebra, and is distant usually about 1½ inches from the upper border of the sternum, lying, at the right border of the sternum and to the inner side of its junction with the second right costal cartilage, at from three quarters of an inch to 1 inch behind that bone. In its course, it passes directly in front and to the left of the trachea, the œsophagus, and the thoracic duct, and arches over the left bronchus.

The convex upper border is in close relation with the left innominate vein, while from it pass off the three main arterial trunks.

Its lower concave border overhangs the bifurcation of the pulmonary artery, and is connected with its left branch by the remains of the ductus arteriosus, this part of the arch being crossed in front and towards the left side by the left pneumogastric and phrenic nerves with cardiac branches of the sympathetic.

The left recurrent laryngeal nerve winds round it, and passes upwards beneath and behind it.

The left pleura and lung cover it to the left.

(1) Table I., cases 19, 24, 27.

(2) Table I., cases 5, 6, 9.

(3) Table I., cases 11, 19.

Of 29 cases of aneurysm of this portion,
23 occurred in males,
6 „ females,
the respective ages being given in the appended tabular form, in which it will again be noticed how large a proportion occur between the ages of 35 and of 55 years.

15 —		25—		35—		45—		55—65		Total.	
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
—	—	3	—	11	3	6	1	—	2	21	6
				21							

The age of two cases was not specified.

A case also occurred in a male aged 66.

The artery was atheromatous in 24 of the cases, and highly so in 8. (In the remaining 5, there was no note of its condition.)

All the valves of the heart were healthy in 21 cases, and in 2 only were the aortic valves incompetent.

The larger number involved in greater or less degree the whole length of the tranverse portion of the arch, having their origin more often (10 cases) from the posterior wall.

Five cases arose at the origin of the innominate artery (1); whilst 2 had origin close to the orifice of the left subclavian artery (2).

The innominate artery was involved in the aneurysm in 6 cases (3); but it was very rare for the other large arterial trunks to be so involved.

The left carotid and left subclavian arteries were each so involved in one instance only (4).

The direction most commonly taken appears to have been *directly backwards;* and in 11 cases there occurred a greater or less degree of pressure upon the trachea (1) within 2 inches of its bifurcation, often attended with erosion of its cartilaginous rings.

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(1) Table II., cases 8, 9, 10, 11, 12.
(2) Table II., cases 2, 3.
(3) Table II., cases 8, 9, 10, 11, 12, 13.
(4) Table II., cases 8, 22.

In several cases the direction taken was *upwards, to the right, and towards the surface,* usually pressing forward or eroding the first bone of the sternum (2), or presenting anteriorly close to the right side of the sternum in the first and second right interspaces, it might be eroding the second right costal cartilage (3) with the portion of sternum corresponding thereto, and compressing and forming adhesions to the neighbouring lung (4).

In 2 instances the tumour reached high into the neck, and presented above the episternal notch (5).

The structures most often subjected to pressure were the trachea (6) and the left bronchus (7).

In 2 cases, where there existed great pressure upon the anterior wall of the trachea, the left recurrent laryngeal nerve had been also compressed and flattened (8).

The left innominate vein was much compressed in 2 cases (9); but in none had there been any pressure upon the vena cava superior.

The disease had terminated by rupture in 7 instances: in no case into the right pleura (10); in 2 cases into the left pleura (11); in 2, into the left bronchus (12); in one, by a small opening into the trachea (13), whilst in 2 others the aneurysm was ready to burst in one or more places into it.

In the case of a female, aged 60 (14), there had taken place rupture through the inner and middle coats, at the origin of the

(1) Table II., cases 4, 9, 10, 11, 13, 14, 15, 18, 22, 25, 28.
(2) Table II., cases 1, 6, 12, 22, 23, 26, 29.
(3) Table II., cases 19, 22, 26.
(4) Table II., cases 19, 29. See also case 26.
(5) Table II., cases 11, 29.
(6) See note (1) above.
(7) Table II., cases 15, 16, 17.
(8) Table II., cases 9, 10.
(9) Table II., cases 8, 11.
(10) Compare this with effects of aneurysm of the first part of the arch.
(11) Table II., cases 2, 3.
(12) Table II., cases 12, 24.
(13) Table II., case 8.
(14) Table II., case 7.

innominate artery, the external coat being quite separated from the middle coat, with blood clot intervening. Final rupture had taken place into the pericardium, at the right side of the aorta, just where it arose from the heart.

In one case, death was due to great œdema of the aryteno-epiglottidean folds, entirely closing the orifice of the larynx (1); and in another, tracheotomy had been performed for the relief of extreme dyspnœa, without associated physical signs (2).

The Third or Descending portion of the Arch.

At the orifice of the left subclavian artery commences the third change in the general direction of the aorta, which now takes a course downwards, and to the left, reaching the spinal column at the left side of the body of the third dorsal vertebra, and passing thence, in a straight course downwards, to the level of the lower border of the fourth dorsal vertebra.

It is covered anteriorly by the left pleura and root of the left lung. To the right side lies the œsophagus, with the thoracic duct; and to the left is the left pleura.

Of aneurysm of this part there were 10 instances:

7 occurred in males,
3 ,, females.

Table of Age.

25—35		35—45		45—55		Total.	
M.	F.	M.	F.	M.	F.	M.	F.
3	1	2	1	2	0	7	2

The age of one female was not recorded.

The valves of the heart were healthy in 9 of the 10 cases.

The artery was diseased in all.

In 7 of the cases the aneurysm occurred just below the origin of the left subclavian artery at the point where, as I have observed, the aorta first commences to take a direction downwards. In so many as 6 of the cases the direction taken by the tumour was *backwards and to the left*, the tumour coming to lie to the left of the spine in the interscapular region (1), and eroding one or more of the bodies of the third, fourth, fifth, sixth, and seventh dorsal vertebræ (2), the left lung being adherent to and forming the wall of the aneurysm in six instances (3).

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(1) Table II., case 29.

(2) Table II., case 9.

In case 10 (of Table III.) an aneurysm of the third part lay against the third and fourth dorsal vertebræ. The bodies of these vertebræ, together with the fourth left rib it had eroded and thus had projected as a tumour visible in the back. The spinal canal lay open to the thorax, and the spinal cord was compressed. The dura water of the cord was entire, and the spinal cord itself was not softened.

The œsophagus had been in three instances subjected to pressure (4). The trachea, left bronchus, and left vagus nerve had been each in one instance more or less compressed (5).

In so many as 7 cases the disease had terminated in rupture of the aneurysm; in 5 cases into the left pleura (6); in 2 into the œsophagus (7).

Amongst the former class, an aneurysmal sac having origin just beyond the left subclavian artery, bursting downwards had dissected the mucous from the muscular coat of the œsophagus so far as the upper border of the diaphragm, where blood had flowed through a small orifice into the left pleural cavity (8).

The descending Thoracic Aorta.

From the lower border of the fourth dorsal vertebra, the aorta passes with a slight inclination from left to right (and therefore presenting towards the right a slight convexity) and with but little variation of caliber, to the opening between the crura of the diaphragm opposite to the twelfth dorsal vertebra, lying there in nearly the middle line of the body.

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(1) The scapula extends from the level of the second to that of the seventh dorsal vertebra. See Holden's Landmarks, p. 26.

(2) Table III., cases 1, 3, 4, 5, 8, 10.

(3) Table III., cases 1, 2, 7, 8, 9, 10.

(4) Table III., cases 3, 4, 5.

(5) Table III., cases 3 and 4.

(6) Table III., cases 1, 6, 7, 8, 9.

(7) Table III., cases 3 and 5.

(8) Table III., case 10.

It is placed near against the vertebræ and closely follows the bend of the spine, having a concavity forwards in the dorsal region, and being comparatively fixed to the spine by the several intercostal branches given off from it on either side.

Placed anteriorly to it above are the left bronchus, left pulmonary artery and the posterior part of the pericardium, whilst the œsophagus, which above has been lying to the right, passes opposite to the tenth dorsal vertebra to lie upon the artery.

Close to it on the right are the azygos vein, thoracic duct and the œsophagus (above); the left lung and pleura being to the left.

Of aneurysm of this part of the aorta there were eight instances, all of which occurred in males, the ages of six being between that of 45 and of 52 years.

The valves of the heart were competent in 7 (1). The artery was diseased in all.

No portion of the artery could be marked as being pre-eminently the region of disease.

The greater number occurred within a few inches of the passing of the artery through the crura of the diaphragm to enter the abdominal cavity (2), the aneurysm being generally placed either upon or, more usually, to the left side of the bodies of the dorsal vertebræ (3).

In one instance, the neighbouring ribs had been necrosed and broken, 2 inches of each having entirely disappeared, and the tumour had caused compression of the spinal column and had presented, visible externally, in the back (4).

Moreover, in more than one case it was noticeable how great had been the extent of the cavity of the aneurysm (5).

In *every* case there had been great pressure exerted against two or more of the dorsal vertebræ, which in two instances formed the posterior wall of the aneurysm (1).

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(1) In the remaining case no note occurs of their condition.

(2) Table IV., cases 1, 2, 3, 6, 7.

(3) Table IV., cases 1, 2, 3, 5, 8.

(4) Table IV., case 5.

(5) Table IV., cases 2, 5, 8.

The *lower five* dorsal vertebræ were those most commonly eroded (2), and in two instances there had been extensive associated destruction of the ribs (3).

In case 1 (Table IV.) the degree of pressure exerted had been so great, that incipient lordosis had occurred. The œsophagus, here, passed over the wall of a smaller sac and a communication existed between it and the sac. The thoracic duct and vena azygos had been obliterated. With these exceptions, no other effects of pressure were observed.

In six, of the eight cases, rupture had occurred: twice into the left pleura (4), once into the right (5); twice into the œsophagus (6), and once into the subserous connective lying to the right of the spinal column (7).

The Abdominal Aorta.

After passing through the crura of the diaphragm the aorta appears in the abdomen on the front of the last dorsal vertebra and descending a little to the left side of the vertebral column divides into the common iliac arteries opposite to the middle of the fourth lumbar vertebra. As it descends it diminishes rapidly in size and describes a slight curve with convexity forwards, the greatest convexity being opposite to the third lumbar vertebra. It is attached and relatively fixed to the left side of the bodies of the first four lumbar vertebræ.

Its anterior surface is in approximation successively with the pancreas, splenic vein, left renal vein, and peritoneum, the cardiac portion of the stomach lying near to it on the left side.

To the right side is the vena cava inferior, the right crus of the diaphragm being interposed above.

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(1) Table IV., cases 1 and 3.
(2) Table IV., cases 1, 2, 3, 6, 8.
(3) Table IV., cases 2, 5.
(4) Table IV., cases 4, 8.
(5) Table IV., case 6.
(6) Table IV., cases 1 and 7.
(7) Table IV., case 3.

The thoracic duct and azygos vein are in close proximity on the same side.

Of aneurysm of the abdominal aorta, there have been 9 fatal cases.

All occurred in males, and there was a strange uniformity in their ages.

So many as 5, were fatal at the age of 39 years; 2 at 40; the ages of the others were respectively 34 and 50 (1).

The valves of the heart were healthy in 7, the aortic valves incompetent in 2 instances.

There was a marked uniformity also in the position of the aneurysm.

In one, it occurred as the artery lay between the crura of the diaphragm (2).

Six sprang from it immediately beneath the diaphragm (3).

One had origin just below the cæliac axis (4); whilst one arose midway between the left renal artery, and the bifurcation of the aorta into the common iliac trunks (5).

In 4 instances (6), the upper lumbar vertebræ were eroded; in none of the others did any erosion occur.

Of the 9 cases, 8 had terminated by rupture, so many as 5 bursting into the retro-peritoneal connective tissues on one side or other of the spine (7).

One of these (8) arising just below the cæliac axis had burst first into the retro-peritoneal connective tissues and later through a rent in the diaphragm into the left pleura; whilst another (9), arising midway between the left renal artery and the iliacs, had apparently burst first into the substance of the left psoas muscle, and had finally made its way through a rent in the peritoneum covering the rectus muscle into the general peritoneal cavity.

(1) This gives an *average* age of 40 years.

(2) Table V., case 1.

(3) Table V., cases 4, 5, 6, 7, 8 9.

(4) Table V., case 2.

(5) Table V., case 3.

(6) Table V., cases 3, 5, 8, 9.

(7) Table V., cases 1, 2, 5, 7, 8.

(8) Table V., case 2.

(9) Table V., case 3.

Rupture had taken place in two instances into the left pleura (1); in one, into the right pleura through a rent near the right pillar of the diaphragm (2).

In recapitulation:

The statements that have preceded go to confirm and prove that *aneurysms of the first part of the arch* arise with great frequency, immediately above the heart's valves, from the right or from the dextro-anterior aspect of the artery, and take a direction generally to the right, presenting externally near to the sternum in the third right costal interspace. That the vena cava superior, and pulmonary artery are the structures more frequently subjected to pressure by aneurysm of this part; and that rupture, occurring seldom, is usually either into the pericardium or into the right pleura.

That *aneurysms of the second portion of the arch* most commonly take direction either directly backwards (compressing the trachea), or upwards, to the right, and towards the surface, presenting beneath the first bone of the sternum, or in the first and second right costal interspaces. That the innominate artery is seldom, the other large arterial trunks but very rarely involved in the disease; that the trachea is the structure far the most frequently subjected to pressure, with occasional added compression of the left recurrent laryngeal nerve, the vena innominate being seldom, the vena cava superior never thus compressed; that rupture occurring rarely, takes place either into the left pleura, left bronchus or trachea.

That, *of aneurysms of the third part of the arch*, the most common origin is just below the orifice of the left subclavian artery, and that they take a course backwards and to the left, lying to the left of the spinal column in the interscapular region, commonly eroding more than one of the upper dorsal vertebræ, the œsophagus being now more frequently subjected to pressure; that these aneurysms tend frequently to termination by rupture into the left pleura or the œsophagus.

That *aneurysms of the thoracic aorta* arise very commonly near to the diaphragm lying either upon or to the left side of the dorsal vertrebræ in this region, almost always causing great pressure on one or more of the lower dorsal vertebræ, and terminating with great frequency by rupture of the sac.

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(1) Table V., cases 2 and 9.

(2) Table V., case 4.

That *aneurysms of the abdominal aorta* arise most often just below the diaphragm, and that they terminate very frequently at about the age of 40 years by rupture into the retro-peritoneal connective tissues, or, having first formed a diffuse aneurysmal sac in the muscles or connective tissues lying at the back of the abdominal cavity, may rupture finally into the general peritoneal cavity, or upwards through the diaphragm into one or other pleural cavity.

It is to be noticed that 60 cases out of 88 occurred in the ascending or transverse portions of the arch; the remaining 28 being evenly distributed over the 3 remaining anatomical divisions of the artery.

The former are, of course, the parts of the aorta most commonly and earliest affected by disease, and first called upon to bear the strain of any increase of blood pressure.

The play (descent and ascent) during the movements of inspiration and expiration are much greater in these parts, the curve of the arch being thereby rendered more acute, straightened and lowered, whilst the descending aorta from the point at which it comes into contact with the spine is relatively fixed by the several intercostal branches proceeding from it on either side.

It should be noticed, too, how rarely—in 10 only out of these 60 cases—incompetence of the aortic valves had occurred.

My very grateful acknowledgments are due to Dr. Norman Moore, Assistant Physician, and at the present time Demonstrator of Morbid Anatomy at St. Bartholomew's Hospital, for ready access to the registers of the Hospital which he has allowed to me, and for many added kindnesses.

APPENDIX OF THE CASES

ARRANGED IN A TABULAR FORM.

TABLE I.—ANEURYSMS OF THE FIRST OR ASCENDING PORTION OF THE ARCH.

Reference *	Sex	Age	Part of Aorta affected.	Direction and Effects.	State of Valves.	State of Aorta.	Cause of Death.	Observer.
1. I. 201	M.	40	1 in. above aortic valves, arch gradually dilated into a fusiform aneurysm; hence an opening into a sacculus abutting on and almost occluding V.C.S. (A smaller sacculus anteriorly).	Pressure on vena cava superior.	Aortic v. thickened.	Calcification in wall of sac.; sl. puckering elsewhere.	—	Dr. Church.
2. I. 244	M.	49	Greatly dilated ascending aorta with large sacculated aneurysm in connection with R. lateral wall, springing 2in. above aortic v.	Occupying antr. mediastinum and R. pleural cavity.	Healthy.	Sl. atheroma at commencement.	—	,,
			A 2nd aneurysm from anterior and L. wall just below origin. of innominate artery.	Causing erosion of L. side of sternum, 3rd costal cartilage and rib, and absorption of intercostal muscles.				
			A 3rd, formed by dilatation of aortic wall at commencement of descending portion.	Slightly eroding vertebræ.				
			2 or 3 further aneurysmal dilatations of abdominal aorta.					
3. I. 333	M.	40	Immed. above valves aorta dilated into large aneurysm, with secondary sac bulging from it above.	Both sacs in immediate relation with sternum; heart and pericardium pushed down to left; erosion of L. side of manubrium; also cartil. 2nd and 3rd L. ribs with sternum corresponding.	Healthy.	Natural below L. subclavian.	—	,,
4. II. 69	M	48	Aorta much dilated from valves to 1in. beyond L. subclavian. Aneurysm from R. side of middle of ascending part.	3rd and 4th R. cost. cartil. with their intercostal spaces formed anterior wall of tumour. 3rd and 4th R. c.c. with R. ½ of sternum corresponding, much absorbed. S. V. C. somewhat flattened.	Aortic v. incompetent.	Calcareous in dilated part.	—	Dr. Gee.
5. II. 127	M	56	Right side of ascending portion.	Tumour in antr. mediastinum immed. above pericardium, rupturing thro. opening there into R. pleura.	Aortic v. thickened and incompetent.	Asc. and transv. portions greatly dilated.	Rupture.	,,

6.	II. 227	M.	34	Right side of ascending aorta midway between valves and Innominate.	2nd, 3rd, 4th R. ribs entirely removed in front; pectorales spread out over tumour, and skin thin. Diaphragm on R. side much depressed. Rupture at lower part into R. pleura.	Healthy.	Much dilated to 2in. below L. subclav.	Rupture.	Dr. Gee.
7.	II. 260	M.	36	Right side of ascending portion.	Occupying antr. mediastinum. Heart depressed; lungs pushed to R. and L. V.C.S. and venæ Innominatæ much compressed. Some pressure on R. pulmon. artery.	Healthy.	Sl. atheroma throughout.	? Large serous effusion in both pleuræ.	,,
8.	II. 303	M.	32	A slit immed. above valves led directly into aneurysmal cavity opening near heart into V.C.S.	— .	Sl. atheroma.	Highly atheromatous.	—	Dr. Wickham Legg.
9.	II. 341	M.	48	Whole of arch greatly dilated, especially ascending part, whence a pouch leads.	Pressing on junction of 2nd R. c.c. to rib and eroding these parts for about 1in. Apex of R. lung formed wall of aneurysm. Rupture through it into R. pleural cavity.	Healthy.	Atheromatous.	Rupture.	Dr. Gee.
10.	III. 237	M.	50	Whole arch greatly dilated to 1in. below L. subclavian. Pouch from dextro-anterior wall of ascending portion.	Occupying antr. mediastinum, lying close upon sternum.	Healthy.	Everywhere highly atheromatous.	—	,,
11.	III. 313	M.	57	Whole arch greatly dilated to 1in. below L. subclav.; just above one semilunar valve on R. antr. aspect of aorta is a ragged opening into pericardium.	Trachea much compressed by small pouch from aneurysm; one cartilage eroded; L. Ven. Innom. crosses aneurysm.	Healthy.	Descending aorta full of bony plates.	Rupture.	,,
12.	IV. 114	M.	37	Sac. behind postr. semilunar valve.	—	Aortic valves incompetent	Sl. dilated.	—	Dr. Norman Moore.
13.	IV. 377	M.	45	Immed. above aortic valves is opening into aneurysm.	Narrowing of conus arteriosus, and interference with nat. shape of pulmonary valves.	Left valves sl. atheromatous.	Atheromatous.	—	Dr. Wickham Legg.
14.	IV. 409	M.	28	On R. side of aorta 1in. from ventricle two large holes lead into aneurysm. Beyond these openings is another small aneurysm.	Pressing on apex of R. lung.	Healthy.	Highly atheromatous.	—	,,

* The references are to volumes of the *post-mortem* registers of St. Bartholomew's Hospital.

Reference.	Sex	Age	Part of Aorta affected.	Direction and Effects.	State of Valves.	State of Aorta.	Cause of Death.	Observer.
15. V. 97	F.	53	R. side of aorta immed. above valves.	—	Aortic v. thickened; mitral atheromatous.	Fairly healthy.	—	Dr. Wickham Legg.
16. V. 173	F.	40	Immed. above valves.	Bulging from R. side of this presses much on S.V.C. A bulging from L. side presses on pulmon. artery.	Aortic } highly mitral } atheromatous incompetent.	Atheromatous throughout.	—	"
17. V. 275	M.	42	1in. above valves.	Extending forwards and to R., pressing on L. side of pulmon. artery, also upon I.V.C. and S.V.C.	Healthy.	Sl. atheroma.	—	Dr. Norman Moore.
18. V. 337	M.	54	Aorta immed. above valves dilated into sac, which led by wide opening into a larger sac.	Adherent to 1st bone of sternum, inner surface of which is roughened.	Healthy.	Atheromatous beyond L. subclav.	—	Dr. Wickham Legg.
19. V. 345	M.	37	Aorta dilated immed. above valves. Hence lead two sacs; one to right; one from back part of aorta, also bulging to right.	This pressed on S.V.C. and ruptured into pericardium.	Healthy.	Some atheroma.	Rupture.	"
20. V. 365	M.	39	"On opening aorta," an opening to the left leads into small aneurysm.	Pressing on and flattening pulmon. artery; as also its R. branch.	Healthy.	Healthy.	—	"
21. VI. 133	F.	38	Sinuses of Valsalva dilated into aneurysms; one over R. valve; one over fore-valve.	—	Healthy.	Atheromatous near aneurysm.	Uncertain. Death sudden. Heart not fatty.	Dr. Wickham Legg.
22. VII. 21	F.	50	R. side of aorta, 1in. above valves.	Bulging on R. side of chest, close to upper part of sternum.	Healthy.	Highly atheromatous to cœliac axis.	—	"
23. VII. 87	M.	44	Aorta greatly dilated from immed. above valves to origin of Innominate; hence a small aneurysmal sac.	Tumour projected at upper border of R. axilla.	Aortic v. incompetent.	Highly atheromatous to L. subclav.; slightly so beyond.	—	Dr. Norman Moore.

24.	VII. 189	M.	45	Large aneurysmal sac above coronary artery and below Innominate.	Enormous tumour in mid-chest and on R. side. R. lung firmly adherent and forming wall of cavity. 2nd, 3rd and 4th R. ribs much eroded with much of upper part of sternum.	Healthy.	Highly atheromatous.	—	Dr. Norman Moore.
25.	VII. 259	M.	27	Small aneurysm between orifices of coronary arteries.	Pointing towards pulmon. artery and pressing upon it just above valves.	Aortic v. thickened, incompetent.	Arch highly atheromatous.	—	Dr. Ormerod.
26.	VII. 273	M.	39	Aneurysm immed. above valves and extending 1in. beyond origin of L. subclavian.	Cavity extended chiefly backwards and upwards against trachea. Tracheal wall perforated just above bifurcation.	Healthy.	Highly atheromatous.	—	Dr. Norman Moore.
27.	VII 293	M.	54	Large aneurysm of anterior part of ascending portion, with a small additional sac beyond L. subclav. and fusiform extension up Innom. artery.	Tumour adherent to chest-wall from 3rd L. rib upwards. L. lung retracted and adherent to back of tumour. Caliber of main pulmon. artery and of its L. branch narrowed. L. vagus n. also compressed.	Aortic v. thickened.	Highly atheromatous.	—	„
28.	VIII. 52	M.	44	Aneurysm $\frac{1}{8}$ inch. above valves.	Extending backwards and outwards along upper edge of R. auricle. Had penetrated muscular tissue at upper part of anterior wall of R. auricle.	Healthy.	Highly atheromatous.	—	„
29.	VIII. 341	F.	15	Between attachment of pericardium and origin of Innom. artery.	Mass covered ascending aorta. Pulmon. artery not compressed.	Mitral stenosis. Aortic cusps adherent.	Healthy.	—	Dr. Ormerod.
30.	X. 104	M.	40	Aorta dilated into aneurysmal sac just above valves. About $\frac{1}{4}$ in above and between coron. artery a small hole leads into pouch lying behind one of the pulmonary valves.	Bulk of sac lay behind and and to left of vessel.	No note.	Not elsewhere atheromatous.	—	Dr. Tooth.
31.	XI. 47	M.	63	Small bulging immed. above valves. Fusiform aneurysm 2in. above bifurcation of aorta.	—	Healthy.	Atheromatous.	—	Dr. Norman Moore.

TABLE II.—ANEURYSMS OF THE SECOND OR TRANSVERSE PART OF THE ARCH.

Reference.		Sex	Age	Part of Aorta affected.	Direction and Effects.	State of Valves.	State of Aorta.	Cause of Death.	Observer.
1.	I. 11	M.	31	Anterior part of arch, slightly to right, 2½-in. from aortic valves. Another aneurysmal dilatation just below origin of L. subclavian.	L. lung pushed back; heart pushed down and to left; 2nd and 3rd L. ribs sl. eroded with portion of sternum corresponding thereto.	Sl. thickened. Competent.	Arch widely dilated, atheromatous.	—	Dr. Church.
2.	I. 127	M.	35	In transv. part of arch behind and to inner side of L. subclavian and carotid (their orifices not involved).	Rupture into L. pleura, exact site not noted.	Healthy.	Whole of asog. aorta dilated. Very atheroms. about aneurysm.	Rupture.	”
3.	I. 217	M.	37	Aneurl. sac. immed. beneath origin of L. subclavian, close to root of L. lung.	Opening through lower and antr. border of L. upper lobe into L. pleura.	Healthy.	No note.	Rupture.	”
4.	I. 242	M.	41	Posterior part of arch where aorta in closest relation with trachea A second aneurysm from antr. wall, just below origin of Innom. artery. A third, a little below and to left of the larger aneurysm.	Pressure of larger sac caused absorption of tracheal cartilages and ulceration of m. m. about 2-in. above its bifurcation.	No note.	Not markedly atheromatous.	—	”
	I. 244			See aneurysms of first part of arch, Case 2.					
5.	I. 257	M.	42	Wall of aorta had given way 1in. below Innom. artery. Pouch formed by conn. tissue of mediastinum, pleura and R. lung.	Tumour occupying mediastinum. R. lung much collapsed. Rupture into Pericardium just below its reflection on to aorta.	Healthy.	Ascending aorta much dilated and atherematous.	Rupture.	”
6.	I. 280	M.	44	Aorta immed. above valves dilated into large globular sac. with atheroms. walls. 3in. above valves oval opening leads into pouch of which walls formed by conn. tissue surrounding this part of arch.	Anterior wall of tumour adherent to depression in sternum at jn. of 3rd L. c. c. Some compression of V. C. S. Parts of wall firmly adherent to Pericardium.	Healthy.	Atheromatous.	—	”
7.	II. 173	F.	60	Rupture thro. inner and middle coats at origin of Innom. artery; extl. coat quite separated fr. middle coat, blood clot intervening.	Rupture into Pericardium at R. side of aorta just where arising from heart.	No note.	Atheromatous.	Rupture.	Dr. Gee.

8.	II. 308	M.	?	Aneurysm opens into arch 2½in. fr. sigmoid valves, involving whole of Innominate and part of transverse portion of arch. R. subclavian } spring from sac. R. carotid } L. carotid opens into aneurysm. L. subclav. opens into aorta.	Left vena innominata much stretched over aneurysm. Rupture by small opening into trachea.	Healthy.	Highly atheromatous.	Rupture.	Dr. Gee.
9.	III. 48	M.	39	Sac. formed by great distension of postr. wall of Innominate art. at its origin.	Great pressure on antr. wall of trachea; no erosion. L. recurrent, n. much flattened.	Aortic v. thickened, incompetent.	Highly atheromatous.	(Tracheotomy was performed for Dyspnœa).	,,
10.	IV. 194	M.	49	Sacculated dilatation in middle part of arch involving Innom. artery. (R. carotid and subclavian spring direct from arch.)	Pressure on antr. wall of trachea; cartilaginous rings laid bare. L. recurrent laryngeal n. runs over wall of aneurysm.	Aortic v. incompetent.	Arch dilated, atheromats. natural below.	—	Dr. Wickham Legg.
11.	IV. 336	M.	36	Middle portion of arch converted into aneurysmal sac. Innom. artery had disappeared; R. carotid and subclavian spring directly from sac.	Tumour rises high in neck; presses behind on trachea which in 3 spots is ready to burst. L. Innom. V. obliterated where it crosses sac.	Fine granulations on aortic v.	Arch dilated and highly atheroms.	—	,,
12.	IV. 364	M.	48	Middle part of arch. Innom. artery involved.	Perforation of 1st bone of sternum. Rupture into L. bronchus.	No note.	Atheromatous below.	Rupture.	,,
13.	IV. 375	M.	31	Small aneurysm projected into pericardium at root of vessels; transverse portion dilated into large aneurysmal sac. Innom. artery twisted. L. carotid and subclavian natural.	Aneurysm ready to burst in two places into trachea.	Healthy.	No note.	—	,,
14.	V. 117	M.	42	Aorta dilated from short space above valves to beyond origin of L. carotid.	Pressure on trachea which formed wall of tumour.	Valves of L. side atheromatous.	Atheromatous.	—	,,
15.	V. 137	F.	36	Aneurysm of transverse and descending portions; a small sac. projects from its inner side.	Sac and main aneurysm both pressed on L. bronchus and on trachea just above bifurcation; wall of trachea eroded.	Healthy.	No note.	—	Dr. Norman Moore.

Reference.	Sex	Age	Part of Aorta affected.	Direction and Effects.	State of Valves.	State of Aorta.	Cause of Death.	Observer.
16. VI. 24	F.	53	Aorta natural to L. carotid, there opening into trifid sac.	One sac eroded bodies of 3rd and 4th dorsal vertebræ. Another opened into bronchial tube 1¼in. below bifurcation of trachea; the 3rd passed into main stem of pulmonary artery.	Healthy.	Lower part atheromatous.	—	Dr. Wickham Legg.
17. VI. 350	M.		Whole of inner part of arch from just above valves to origin of L. subclavian (arteries not involved).	Tumour lay behind and above heart, pressing upon and flattening L. bronchus.	Healthy.	Highly atheromatous.	—	Dr. Norman Moore.
18. VII. 361	F.	42	At end of arch, aneurysm projecting backwards, pressing on trachea.	Tracheal rings eroded just above bifurcation.	Healthy.	Atheromatous.	—	,,
19. VII. 377	F.	40	Posterior wall bulged into aneurysm from origin of Innominate to beyond L. subclavian.	Tumour projected in 1st R. intercostal space; 1in. of 2nd. R. rib and muscles of 1st R. interc. space eroded. R. lung pressed down by aneurysm and adherent to it.	Healthy.	Healthy below aneurysm.	—	,,
20. VIII. 55	F.	63	Above valves aorta suddenly widened, bulging sl. more towards greater curve of arch, but whole tube dilated. Width reduced just below origin of L. subclavian, then a sudden widening and fusiform dilatation to bifurcation.	No further account.	Aortic v. sl. thickened.	Whole highly atheromatous.	—	,,
21. VIII. 221	M.	30	Posterior part of transverse portion.	,,	Healthy.	Atheromatous.	—	,,
22. VIII. 292	M.	46	Aneurysm included whole of arch as far as L. subclav.; extending anteriorly and posteriorly. Funnel-shaped dilatation of L. subclav. 1¼in. from origin.	Projection of tumour between 1st and 3rd R. ribs. 2nd R. c.c. and part of sternum eroded; trachea much compressed just above bifurcation; 2 rings partially eroded. Bodies of 2 upper dorsal vertebræ eroded on R. side.	Healthy.	Atheromatous.	—	,,

23.	IX. 286	M.	41	Aneurysm extended from origin of Innominate to L. subclav.; v. irregular in shape.	Projecting mainly forwards through 1st intercostal space and sternum, and barely covered by thin layer of sternum and of pectoral muscle.	Healthy.	Atheromatous throughout.	—	Dr. Norman Moore.
24.	X. 90	M.	54	Aneurysm springing from outer aspect of transv. portion, extending to inner and postr. aspect of L. pulmonary apex. To the right was another small aneurysm.	Erosion through a large branch of L. bronchus and part of L. upper lobe. L. lower lobe full of blood.	Healthy.	Atheromatous.	Rupture.	
25.	X. 125	M.	45	1st aneurysm projected from arch anteriorly and slightly to right, just below origin of Innom. artery. A 2nd projected backwards from arch below, and above origin of L. subclav. artery.	Bulging inwards of anterior wall of trachea just above bifurcation.	Healthy.	Great general dilatn. with much atheroma from valves to junction of ductus arteriosus.	—	
26.	X. 185	M.	42	Aneurysm of ascending part 1in. above valves *and* of whole of transverse part (large vessels arose from sac.). Two fusiform dilatations of descending part.	Aneurysm occupied whole of R. upper lobe. Upper part of sternum sl. eroded; attachment of 2nd rib loosened, and the rib displaced downwards.	Healthy.	No note.	—	Dr. Tooth.
27.	X. 355	M.	66	Whole of transverse, and upper part of descending arch dilated into large aneurysmal sac.	Part of L. lung adherent to sac., L. upper lobe full of blood.	Healthy.	Highly atheroms.	—	,,
28.	XI. 147	M.	37	3in. above valves, small hole in antr. wall leads into sac.	Lying just behind sternum and abutting on trachea.	Healthy.	No note.	—	Dr. Norman Moore.
29.	XI. 168	M.	50	Wide opening into large aneurysmal sac. 2½in. above valves.	Projecting *forwards* in 2nd R. intercostal space and there penetrating the muscle, and *upwards* above episternal notch, and adherent to and pressing forwards upper part of sternum; backwards and to right it compressed R. lung, which was adherent to it. Sternum eroded from 2nd R. c. c. to 1st L. c. c., especially at R. side.	Healthy.	First 2in. atheromatous.	Great œdema of aryteno-epiglottidean folds, quite closing orifice of larynx.	,,

TABLE III.—ANEURYSMS OF THE THIRD OR DESCENDING PART OF THE ARCH OF THE AORTA.

Reference.	Sex	Age	Part of Aorta affected.	Direction and Effects.	State of Valves.	State of Aorta.	Cause of Death.	Observer.
I. 244			See aneurysms of ascending part of arch:—Case 2.					
1. I. 307	M.	45	Small aneurysm from posterior wall just below ductus arteriosus.	Partial absorption of dorsal vertebræ, 4, 5, 6, 7, with shafts of ribs corresponding. Posterior part of L. upper lobe broken down. Rupture into L. pleura.	Healthy.	Greatly dilated and atheromatous from origin to below aneurysm.	Rupture.	Dr. Church.
2. IV. 133	M.	34	Just below origin of L. subclavian.	Pouch lying between aorta and apex of L. lung, which formed its anterior wall.	Healthy.	Highly atheromatous.	Phthisis. Cirrhosis hepatis.	Dr. Wickham Legg.
3. IV. 60	F.	32	Sacculated aneurysm springs ¼in. below orifice of L. subclavian, resting on bodies of 3rd, 4th and 5th dorsal vertebræ.	Bodies of 3, 4, 5, dorsal vertebræ considerably eroded. Large opening into œsophagus. Mass of fibrin projected into œsophagus and compressed trachea.	Mitral stenosis.	Highly atheromatous.	Rupture.	Dr. Norman Moore.
4. V. 19	M.	34	Aorta commenced to be dilated into large aneurysm at origin of L. subclavian artery.	Erosion of 3, 4, 5, 6, dorsal vertebræ. Œsophagus, L. bronchus and L. vagus n. more or less pressed upon.	Healthy.	Whole of thoracic aorta dilated.	—	Dr. Vincent Harris.
V. 137			See aneurysms of transverse part of arch:—Case 16.					
5. V. 241	F.	42	Lower part of descending portion.	Erosion of bodies of vertebræ (unspecified). Gullet pushed somewhat to right; a large opening into it sl. below level of bifurcn. of trachea.	Healthy.	Transv. arch sl. dilated.	Rupture.	Dr. Wickham Legg.
6. VII. 277	M	42	Just beyond origin of L. subclavian posterior surface of aorta bulged into an aneurysm. A slighter bulging on its opposite wall.	Sac. bursting downwards had dissected mucous from muscular coat of œsophagus as far as upper surface of diaphragm, where blood had flowed through a small orifice into L. pleural cavity.	Healthy.	Highly atherous. above valves.	Rupture.	Dr. Norman Moore.

7.	VIII.	282	F.	43 ?	Aneurysm extended for 2in. from origin of L. subclav. artery.	Upper part of L. lung forms part of wall of aneurysm, which had ruptured into L. pleura.	Healthy.	Highly atheromatous.	Rupture.	Dr. Norman Moore.
8	VIII.	309	M.	43	At commencement of descending part just below origin of L. subclav. artery.	Extending chiefly backwards; L. lung firmly adherent to and forming part of aneurysmal wall, as also the much eroded bodies of dorsal vertebræ 4, 5, and 6. Rupture through lung into L. pleura.	Healthy.	Highly atheroms. below aneurysm.	Rupture.	”
	X.	355			See aneurysms of transverse part of arch:—Case 27.					
9.	X.	365	M.	38	Saccular aneurysm of descending portion.	Adherent to inner aspect of apex of L. lung. 4, 5, 6, 7, L. ribs eroded. Rupture at lower part, close to vertebræ, into L. pleural cavity.	Healthy.	Some atheroma of arch.	Rupture.	Dr. Tooth.
10.	XI.	171	M	54	Third part of the arch.	L. lung adherent to aneurysm, which lay against dorsal vertebræ 3 and 4, the bodies of which with the head of the 4th left rib it had eroded and thus had projected as a tumour in the back. Spinal canal was open to the thorax and the cord compressed. Dura mater entire; spinal cord itself not softened.	Healthy.	Highly atheromatous.	—	Dr. Norman Moore.

TABLE IV.—ANEURYSMS OF THE DESCENDING THORACIC AORTA.

Reference.	Sex	Age	Part of Aorta affected.	Direction and Effects.	State of Valves.	State of Aorta.	Cause of Death.	Observer.
1. II. 51	M.	52	Aorta expanded into a flattened sac. lying on front and to L. side of 8th dorsal vertebra, and on attached end of ribs.	No proper postr. wall. Erosion of bodies of dorsal vertebræ 8, 9 and 10. Incipient lordosis.	Healthy.	Descg. aorta atheromatous.	Rupture.	Dr. Gee.
			A secondary sac. bulged from this into postr. mediastinum.	Œsophagus passed over the smaller sac., and much flattened; a communication existing between œsophagus and sac. Thoracic duct and vena azygos obliterated.				
2. II 78	M.	50	Oblong perforation through aorta for 3in. above diaphragm, leading into large sac. lying behind aorta.	Occupying chiefly L. side, and reaching from 7th rib behind nearly to crest of ilium. Diaphragm depressed. Bodies of 9, 10, 11, 12 dorsal vertebræ in degree eroded, especially the 10th. 10th, 11th and 12th L. ribs greatly eroded.	Healthy.	Asc. and transv. portions much dilated and atheromatous. Desc. part also dilated, with 2 pouches capable of lodging half a walnut.	—	,,
3. II. 247	M.	32	Aorta dilated into aneurysm opposite 10th, 11th, 12th dorsal vertebræ.	Postr. wall formed by dorsal vertebræ 10, 11, 12, which were considerably eroded.	Healthy.	Highly atheromatous.	Rupture.	,,
			Two other aneurysms pouched out of this to the right.	The larger sac. had broken into subserous conn. tissue lying to R. of spinal column.				
4. IV. 399	M.	?	Aneurysm at lower edge of 4th dorsal vertebra.	Projecting upwards. Lower edge of body of 4th dorsal vertebra eroded, also bodies of L. v. 5 and 6. Aneurysm had burst at lowest point, close to vertebræ into L. pleura.	Healthy.	Highly atheromatous.	Rupture.	Dr. Norman Moore.

5.	V. 296	M.	34	Orifice of aneurysm 3in. below orifice of L. subclav. Consisted of 4 parts. R. part projected in 2 masses with general direction forwards. L. part consisted next aorta of huge sac. opening into a further cavity beyond, of which walls formed by various eroded tissues.	Swelling visible in L. back. Ribs 3, 4, 5, necrosed and broken (2in. of each having disappeared). Arch of 4th dorsal vertebra wholly eroded on L. side; arches of dorsal vert. 3 and 5 in part so eroded. Cavity extended from 3rd to 10th L. rib; some compression of spinal column.	Healthy.	Slightly atheroma. below aneurysm.	Uncertain.	Dr. Norman Moore.
6.	VI. 179	M.	47	At opening of diaphragm large opening led from back of aorta into a sac. lying by its side, close to vertebræ, and communicating freely with eroded vertebræ.	Bodies of last dorsal and 1st lumbar vertebræ eroded. Rupture close to vertebræ into R. pleura.	All valves thickened. Aortic v. competent.	Atheromatous.	Rupture.	Dr. Wickham Legg.
7.	VII. 253	M.	46	Descending aorta adherent to 5th dorsal vertebra. Small sac. also in ascending part of arch.	Front of 5th dorsal vertebra eroded. Perforation into œsophagus a little lower.	Healthy.	Thoracic part dilated.	Rupture.	Dr. Ormerod.
8.	IX. 101	M.	46	Large sacculated and fusiform aneurysm of thoracic aorta.	Lying on L. side of vertebral column; extending from 9th dorsal to 1st lumbar vertebra. Lower part of sac. passed thro. arch of diaphragm. Dorsal vertebræ 10, 11, 12 eroded on L. side. A large ragged opening into L. pleural cavity.	No note.	Highly atheromatous.	Rupture.	Dr. Tooth.

TABLE V.—ANEURYSMS OF THE ABDOMINAL AORTA.

Reference.	Sex	Age	Part of Aorta affected.	Direction and Effects.	State of Valves.	State of Aorta.	Cause of Death.	Observer.
1. II. 190	M.	39	Aneurysm of aorta between crura of diaphragm. (Also a saccular aneurysm arising immed. after origin of aorta from ventricle.)	No injury to vertebræ. Rupture into retro-peritoneal conn. tissues.	Healthy.	No note.	Rupture.	Dr. Wickham Legg.
2. III. 262	M.	39	Aneurysm of L. side of aorta, just below cæliac axis.	Rupture into retro-peritoneal tissues, and through rent in diaphragm into L. pleura.	Healthy.	Highly atheromatous.	Rupture.	Dr. Norman Moore.
3. IV. 90	M.	40	Aorta dilated immed. after passing thro. crura of diaphragm. Midway between L. renal art. and division into Iliacs is an opening thro. walls of aorta into a space apparently formed in Left Psoas muscle.	Bodies of vertebræ eroded. A rent in peritoneum covering Rectus muscle communicates with this cavity. Much blood in peritoneal cavity.	Healthy.	No note.	Rupture.	Dr. Wickham Legg.
4. V. 262	M.	39	Opening from aorta into large sac. immed. below diaphragm.	Rupture into R. pleura through hole near R. pillar of diaphragm.	Healthy.	—	Rupture.	,,
5. VI. 374	M.	50	On passing through diaphragm aorta opens into a large sac. Large aneurysm also from aorta just above diaphragm.	Erosion of lumbar vertebræ. Rupture on L. side into retro-peritoneal conn. tissues. This had eroded and laid bare the vertebræ and passed on L. side to back where was a cavity covered only by skin of back.	Aortic v. atheromatous; two had grown together.	Much dilated.	Rupture.	,,
6. VIII. 156	M.	39	Immed. below diaphragm, an almost uniform dilatation 3½in. in length.	Pillars of diaphragm spread out on aneurysm and thinned. No erosion of vertebræ.	Aortic v. incompetent.	Highly atheromatous.	—	Dr. Norman Moore.
7. VIII. 171	M.	34	Large aneursym of aorta just below diaphragm, and above cæliac axis.	It had opened below by 2 passages. One leading underneath the peritoneum, the other into the peritoneal cavity.	Healthy.	No note.	Rupture.	,,

8. VIII. 199	M.	40	Aneurysm commenced immed. below diaphragm involving aorta in front for short distance only. Coats of aorta destroyed behind.	Lying mainly to R. of spine, but extending short distance also to left. 1st, 2nd, 3rd, and part of 4th lumbar vertebræ eroded. Rupture into muscles and conn. tissues on R. side.	Healthy.	Atheroma of arch.	Rupture.	Dr. Ormerod.
9. X. 122	M.	39	Immed: below diaphragm in postr. wall of aorta an opening partly filled with laminated clot; a large diffused similar clot extended behind peritoneum into both iliac fossæ.	Tumour of irreg. edge felt in splenic region. Bodies of 3 upper lumbar vertebræ deeply eroded. Diaphragm torn near vertebræ; hæmorrhage through it into L. pleura.	Healthy.	Healthy above and below aneurysm.	Rupture.	Dr. Norman Moore.

THE END.